

A+B BIDDING

GUIDE

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INTRODUCTION

The intent of the guide is to provide project managers with a better understanding of A+B bidding. The manual includes a detailed definition of A+B bidding, its advantages and disadvantages, a guide for selecting what type of projects are candidates for A+B bidding, and instructions on how to compute the Daily Value that is a necessary component for the “B” portion of the bid.

DESCRIPTION

A+B bidding, a cost-plus-time procedure, selects the low bidder based on a monetary combination of the Contract bid items (A) and the time (B) needed to complete the project or a critical portion of the project.

Formula: Bid amount for evaluation = $A + (B \times \text{Daily Value})$, where:

The “A” component is the traditional bid for the contract items and is the dollar amount for all work to be performed under the contract.

The “B” component is a determination of the total number of calendar days required to complete the project, as estimated by the bidder (Calendar days are used to avoid any potential for controversy which may arise if work days were used).

The Daily Value (many agencies refer to this as road-user-cost) is the difference in road user cost during construction as compared to after construction is completed (\$/day). The primary cost for the road user is the additional time required to travel through the construction project as a result of reduced speeds, detours, lane closures and restrictions, and potential queuing. An average hourly value for the occupant(s) is multiplied by this additional time to determine the difference in road user cost. This is multiplied by the ADT (average daily traffic) to determine the daily value.

The formula above is only used to determine the lowest bid for award and is not used to determine payment to the contractor. The contract amount for payment purposes is the A amount only.

The contractor would be assessed liquidated damages should he complete the project after the time specified in his bid (B). Many A+B contracts include an incentive for completing the project ahead of the specified time (B). The incentive/liquidated damages for each day the contractor is early/late is equivalent to the Daily Value. The incentive is capped so not to exceed a certain amount. ADOT stipulates in its specifications that the incentive can not exceed 20% of the days bid by the contractor (B) multiplied by the Daily Value ($0.2 \times B \times \text{Daily Value}$). There is no cap to the amount of liquidated damage, therefore, should the contractor finish the contract after time “B”, the liquidated damages accumulate until the contract is complete.

The Special Provisions contain the time that ADOT estimates it will take to complete the project. For each day it takes the contractor to complete the project after this time period, he will be assessed

liquidated damages equal to the Daily Value plus the amount specified in Section 108.09 of the Standard Specifications.

Appendix A is a copy of ADOT's specifications relating to A+B bidding.

Additional Information can be found on the web at the Utah Technology Transfer Center:

<http://www.ic.usu.edu/IC-Overview/ABBidding/A+BBiding%20overview.htm>

This guide may be updated periodically. The latest version can be found on the ADOT Construction Group's web page: <http://www.dot.state.az.us/roads/constgrp/innovations.htm>

ADVANTAGES AND DISADVANTAGES

Advantages:

Shorten Project Duration

The number one reason to implement A+B contracting is to shorten the duration of highway construction projects when compared to traditional highway contracting. The time specified by the contractor (B) is almost always lower than the agency's estimated time for the construction. When incentives are specified, completion of the project is further accelerated. Most contractors obtain the maximum incentive.

Reduce Inconvenience to the Traveling Public

Shortened project durations translate into reduced levels of inconvenience to the traveling public or road users. Congestion and rerouting of traffic is present for shorter periods of time.

Lessen Potential Impact on Local Businesses and Communities

Shortened project durations lessen the time that business access is potentially disturbed (also access to adjacent neighborhoods).

Encourage Innovative Construction Processes

Allowing the contractor to determine the project duration opens the door for innovative construction processes and methods required to accelerate the project. The contractor could also be innovative with the sequencing of construction in relation to traffic throughout the duration of the project.

Improved Effect of Construction on Public

The use of A+B will decrease the time required for construction. This means that the traveling public will observe that their tax dollars are at work every day and progress is being made on a consistent and continuing basis on a project. Agencies have been subjected to public criticism because of what appears to be long time periods where contractors are not seen working on the project consistently.

Reduction in traffic control costs

Since A+B projects are generally completed in fewer days than projects bid under the conventional method; it follows that the durations that traffic control devices are required on the project will also be less.

Disadvantages:

Drain on Agency Human Resources

A+B reduces the duration that personnel are required on the project. However, the agency must be ready to work the construction schedule as determined by the contractor. Therefore this method often extends the work schedules (hours/day and days/week). Accelerated work schedules require additional personnel to accomplish the work. The work hour requirements or inspection and testing personnel increase but for a shorter duration of time.

Increased Construction Costs

The bid cost (A) on A+B contracts may be slightly higher than traditional contracts of similar scope and size. Also A+B projects with incentives tend to have a higher cost overrun than similar traditionally built projects. However, when road-user-cost is included in the total cost of the project, the cost is almost always less than that of a traditional bid contract.

Decrease in Quality

Some agencies report that the quality of the constructed facility is either the same or worse compared to that of a traditional bid project. Agency personnel find themselves in positions to accept minimum or lower quality work or face costly claims due to time delays. However, there are some agencies with the opinion that quality is better, since the contractor desires no rework. Rework may translate into late completion, which results in liquidated damages charged against the contractor. (One key to insure high construction quality is preparing comprehensive plans and specifications that enable the contractor to plan the work in the most efficient manner. Proper support from the designer is essential for addressing traffic control planning and sequences as well as constructibility problems.)

Unbalanced Bidding

A+B bidding could lead to the contractor unbalancing the bid by increasing 'A' portion of the bid and take all the mobilization advances up front, use them, and return them at project's end as liquidated damages. Add to this that many agencies tend to be lenient when assessing liquidated damages.

Other Factors:

Risk Allocation

Risks associated with estimated and actual construction time are transferred to the contractor. The State Highway Agency (SHA) may be required to make more timely decisions when field problems arise to prevent contractor time delays. Essentials of risk minimization specifically for A+B projects are:

- Well-designed project;
- Detailed traffic control plans;
- Strong support from designers during construction;
- Elimination of third party conflicts (problems related to right-of-ways and utilities);
- Effective and efficient coordination between agency and contractor.

Bonding Requirements

No special surety bonding is required. The contractor is not required to have a bond for the 'B' part.

Specifications

Conventional methods and materials specifications do not always permit the contractor to complete construction in the most efficient manner. Accordingly, QC/QA specifications would provide the contractor enhanced flexibility. In an ideal situation, performance-related specifications would be a possible solution to these problems. Whichever specifications are used, the agency should always try to provide prompt, timely inspections to avoid delaying work operations.

GUIDELINES FOR SELECTING A+B PROJECT

In order to be a candidate for A+B bidding the project must demonstrate a need for accelerated construction; it must be relatively free of third party conflicts; and the SHA must have necessary resources to accommodate an accelerated construction schedule.

1. Demonstrated Need

The project should meet at least one of the following criteria to demonstrate a need for accelerated construction:

- Completion time constraint; these could include weather limitations or a potential interference with major public events.
- Current level of service below “C”.
- Major bridge or roadway out of service due to a natural calamity, such as earthquake or flood.
- Closures or detours that may have a large impact to local businesses
- Safety Considerations:
 - School zone in or adjacent to project;
 - Impairment of emergency vehicle response (hospital, police or fire);
 - Basic need for project is to alleviate accidents;
 - Heavy pedestrian usage;
 - High worker exposure;
- The Road-User-Cost (RUC) exceeds \$3000 (use “Computation of Daily Value” spread sheet to determine). Traffic restrictions, lane closures, or detours result in high RUC. Some causes of high road-user-costs are:
 - Lengthy detours;
 - High traffic volumes;
 - Major reconstruction or rehabilitation on an existing urban facility;
 - Construction causes major traffic disruptions;
- Highly sensitive project (political issues, significant public interest and benefit, completion of a gap in a significant highway system).

2. Free of Third Party Conflicts

Utility conflicts, design uncertainties, or right-of-way issues which may impact the bid letting date or the critical project schedule complicate A+B bidding. Utility relocations and right-of-way purchases can occur during the duration of the project but the completion dates must be accurate.

3. Available Resource Allocation

Although the number of administrative man-hours for an a+b project is generally less or about the same as the same project bid conventionally, the district needs to be aware that the contractor will likely work longer hours. This will require an increase in man-hours per day; overtime, weekend work, multi-shifts should be expected.

If a project is especially time-critical and it is cost-beneficial to use them, incentive provisions will motivate contractors to further shorten the construction duration. Consider using A+B bidding with an incentive provision if:

- The RUC is high, and the monetary benefit to the highway user equals or exceeds the contractor’s costs to finish early and earn the maximum incentive.
- It is in the public interest to complete the project as soon as possible.

Consider A+B bidding without an incentive provision if:

- The project is not required to finish ahead of a specific completion date.
- RUC is not severe but other factors warrant expediting the project.

HISTORY

Via A.R.S. § 28-6923, the Legislature allowed the Arizona Department of Transportation (ADOT) to implement a pilot using A+B bidding as an alternative method to determine the lowest bidder; providing it was deemed in the best interest of the public. The pilot allowed for this alternative to be utilized for up to 20 highway construction contracts for the period of October 1, 1997 through October 1, 1999. During this period of time ADOT awarded six projects using A+B bidding.

Upon conclusion of the pilot the Auditor General reviewed ADOT's A+B bidding program and recommended it be made a permanent alternative contracting method.

A.R.S. § 28-6923 was modified, and on April 4, 2000 the Legislature allowed A+B bidding as a permanent alternative method of contracting to determine the lowest bidder.

The current wording of A.R.S. § 28-6923 (I) is:

“In determining the lowest responsible bidder under this section, the department and the board may consider the time of completion proposed by the bidder if the department and the board determine that this procedure will serve the public interest by providing a substantial fiscal benefit or that the use of the traditional awarding of contracts is not practicable for meeting desired construction standards of delivery schedules and if the formula for considering the time of completion is specifically stated in the bidding information.”

Appendix B is a list of completed projects (through 11/1/01) that used the A+B bidding method. A list of these projects is maintained on ADOT's Construction Group's web page under Innovative Contracting: <http://www.dot.state.az.us/ROADS/constgrp/index.htm>

METHODOLOGY

The value of “B” in A+B bidding is the product of the number of calendar days the contractor specifies in his bid to complete the project and the Daily Value. The Daily Value is an estimate of the average cost per day to motorists and business due to traffic restrictions and potential decreased safety throughout the course of a construction project.

The **Daily Value** = (AADT) x (Δt) x (w) x (f) x (d), where:

- **AADT** = the Average Annual Daily Traffic (ADT);
- **Δt** = the additional time required by the motorist to travel through the project while under construction, as compared to when the project is completed;
- **w** = the average hourly wage of the motorist;
- **f** = a factor that takes into account impacts to local businesses and safety;
- **d** = the weighted duration

Calculation of Daily Value

Almost every transportation agency has its own way to calculate the road-user-cost (RUC). An AASHTO Task Force is currently looking into a singular method to calculate the RUC. Until this occurs, ADOT has developed their own method based on concepts in the “Highway Capacity Manual” and on simplistic predictions of the AADT. Appendix C is a copy of the excel spreadsheet used to calculate the Daily Value. An electronic version can be obtained on the Construction Group’s web page.

The following is the basis for the formulas in the spreadsheet.

Average Annual Daily Traffic (AADT)

Periodically ADOT performs traffic counts at numerous locations on the State Routes, U.S. Highways and Interstates throughout the state. These counts are converted to the AADT.

The Average Annual Daily Traffic can be obtained from the TPD Data Team’s web page:

<http://map.azfms.com/datateam/reports/index.html>

Additional Time (Δt)

Additional time to travel through the work zone can be caused by:

- Narrower lane widths, adjacent shoulder drop-offs, construction workers and equipment in the vicinity necessitating a reduction in the posted speed limit.
- Detours that add extra miles to the motorists drive.
- Lane closures/restrictions forcing traffic into one lane from two, where the two lanes were already near capacity.
- Stoppage of one or both directions of traffic for a period of time.

Exhibit 1 is ADOT’s depiction of the time it takes to drive from point a to point b:

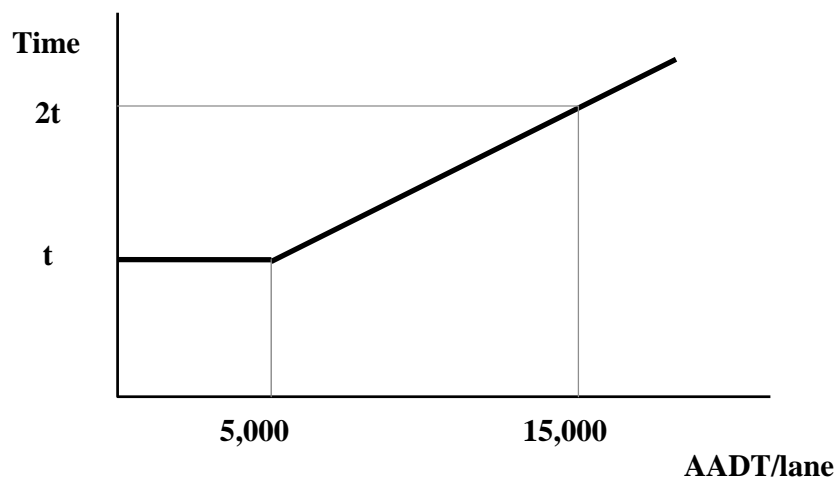
This graph shows that it takes time “t” to travel from point a to point b when the AADT per lane = 5,000 or less. (Level Of Service of A/B). In ADOT’s model, time increases linear as the ADT per lane increases over 5,000. The linear increase is based on the assumption that at a Level of Service

of D/E, or approximately 15,000 ADT per lane, it would take twice the amount of time ($2t$) to travel from point a to point b (as compared to an ADT per lane of 5000).

This linear depiction is then applied to compute the time to travel through the project during construction (t_c) and the time to travel through the project after construction is finished (t_f). The additional time (Δt) required to travel through the project is the difference between the two: $\Delta t = t_c - t_f$

The basic formula $\text{velocity} = \text{distance} / \text{time}$ is used to calculate the time required to travel from point a to point b. Refer to Appendix D to see more details on the calculation of Δt .

Exhibit 1



Average Hourly Wage (w)

The hourly wage is currently \$11.50/hr for non-commercial vehicles and \$18.50/hr for commercial vehicles. These figures were obtained from Table 2.13, Recommended Value of Time, from Publication No. FHWA-SA-98-079, Life Cycle Cost Analysis in Pavement Design.

To determine the average hourly wage the percent of commercial vehicles using this portion of the highway should be determined. ADOT's TPD Data Team has compiled these percentages and they are available at their web site: <http://map.azfms.com/datateam/reports/index.html>

$$w = \text{avg. hourly wage} = (c)(\$18.50) + (1-c)(\$11.50)$$

$$c = \% \text{ of commercial vehicles}$$

Impact Factor (f)

Detours, closures, and lane reductions do not only impact the road user. There may be other reasons to accelerate construction (i.e., loss of revenue to local businesses, limit the exposure to pedestrians, correct an existing high accident section of the roadway).

The factor **f** equals 1.0 unless the construction will have impacts on areas other than the road user. ADOT currently uses a factor of 1.2 when the construction will significantly impact local businesses. This 20% increase is an estimate; there is no data to back up this factor.

To determine **f**, total all relevant factors below and add to 1.0.

concentration of businesses use = 0.2*

history of a high number of traffic accidents = 0.2*

heavy pedestrian usage or school in vicinity = 0.2*

Weighted Duration (d)

This is the duration of a specific traffic control condition divided by the estimated duration of the project. The duration of these conditions is measured in calendar days.

In most cases there is more than one traffic control condition that impacts traffic throughout the duration of the project; the Daily Value is calculated for each one. These are added together to determine the net Daily Value. In determining the Daily Value, it is not the intent to calculate the impact of *every* single condition occurring; only the major ones.

* The values of 0.2 are all assumptions; there is no data to back these figures up.

APPENDICES

APPENDIX A

Special Provisions for A+B bidding

GENERAL REQUIREMENTS:

**** INSERT THE FOLLOWING AT THE BEGINNING
OF THE GENERAL REQUIREMENTS ****

A+B BIDDING PROCEDURE:

The method for determining the lowest responsive bidder for this project is known as “A+B”, and will take into account not only the price offerings of the bidder, but also the time within which the contractor can substantially complete the project. The “A” portion of the A+B bid will be the summation of the products of the quantities shown in the bidding schedule and the contractor’s unit price bid for each item. The “B” portion of the A+B bid will be the product of the contractor-specified completion time and the daily value, as determined by the Department and shown in the special provisions and on the bidding schedule.

The bidder shall specify the total number of whole calendar days required to complete the work, and enter the number on the last page of the bidding schedule. The number of calendar days specified by the bidder shall be equal to or less than the number of days determined by the Department, as shown in the special provisions. Bids received that exceed the Department-determined completion time in calendar days will be considered non-responsive. The total bid cost for construction (“A”) added to the product of the number of contractor-specified calendar days times the daily value (“B”) will be the amount used for comparison of bids in establishing the lowest responsible bidder for award purposes.

**** INCENTIVE / NO INCENTIVE OPTIONS:

*** ADD ONE OF THE FOLLOWING SECTIONS AS APPROPRIATE,
AND DELETE UNNEEDED SECTION AND ITALIZED HEADINGS.
FILL IN ”DAILY VALUE”---CONTACT
CONSTRUCTION GROUP FOR DIRECTIONS. ***

(Incentive Option)

Payment to the contractor will be based on the “A” portion of the A+B bid plus the following incentive for timely completion of work. A daily value of _____ has been established for this project, and will be paid to the contractor, as an incentive, for each whole calendar day that work is complete prior to the number of calendar days specified by the contractor in its bid. The maximum number of calendar days for which incentive will be paid will be limited to 20% of the number of calendar days specified in the contractor’s bid.

The daily value will be deducted from the monies due the contractor for each whole or partial calendar day beyond the contractor-specified completion time that work is not substantially

complete. Liquidated damages will be assessed for each whole or partial calendar day beyond the Department-determined completion time that work is not substantially complete. Such deductions will be as specified in Subsection 108.09. Substantial completion will be determined as specified in Section 105.19.

(No Incentive Option)

Payment to the contractor will be based on the “A” portion of A+B bid. A daily value of _____ has been established for this project. The daily value will be deducted from the monies due the contractor for each whole or partial calendar day beyond the contractor-specified completion time that work is not substantially complete. Liquidated damages will be assessed for each whole or partial calendar day beyond the Department-determined completion time that work is not substantially complete. Such deductions will be as specified in Subsection 108.09. Substantial completion will be determined as specified in Section 105.19.

(Add the following to the end of these A+B general requirements.)

A+B BONDING PROCEDURE:

The bid bond, payment bond and performance bond required for this contract shall be based on the total construction cost bid (the “A” amount) only.

DISADVANTAGED BUSINESS ENTERPRISES:

When a requirement for DBE participation is specified, the minimum goal for participation by DBEs will be based on the total construction cost bid (the “A” amount) only.

(Use the new proposal sheet.)

(Insert the following as special provisions.)

SECTION 101 - DEFINITIONS AND TERMS:

101.02 Definitions: the definition of **Contract Time** of the Standard Specifications is revised to read:

The number of calendar days specified by the contractor for completion of the A+B contract, including authorized time extensions.

The Department-determined completion time will be shown in the special provisions. The contractor-specified completion time is the total number of calendar days proposed in the contractor’s A+B bid, and shall be entered on the bidding schedule.

For projects awarded based on the A+B method, Contract Time shall be defined as the contractor-specified completion time.

SECTION 101 - DEFINITIONS AND TERMS:

101.02 Definitions: the definition of **Liquidated Damages** of the Standard Specifications is revised to read:

A specified amount set forth in the contract as a reasonable estimate of the Department's damages caused by the contractor's failure to substantially complete the contract within the Department-determined completion time.

SECTION 102 - BIDDING REQUIREMENTS AND CONDITIONS:

102.01 Advertisements for Bids: the sixth line of the tabulated items of the Standard Specifications is revised to read:

Department-determined completion time in calendar days,

SECTION 102 - BIDDING REQUIREMENTS AND CONDITIONS:

102.08 Preparation of the Proposal: the second paragraph of the Standard Specifications is revised to read:

The bidder shall specify a unit price, in figures, for each pay item for which a quantity is given in the Bidding Schedule and shall also show the amount extended, as the product of the quantity given and the unit price indicated for each bid item, in the column provided for that purpose. In the event that more than two decimal places are used in representing a unit price, all digits beyond the second decimal place will be truncated and the extended amount for the affected item(s) and the total bid will be recomputed accordingly. The total amount of the construction cost bid ("A" portion) shall be obtained by adding the amounts of the several items. The bidder shall determine the "B" portion by entering the contractor-specified completion time, in whole calendar days, on the Bidding Schedule, and multiplying the contractor-specified completion time by the daily value established for the project. The bidder shall add this amount to the total construction cost bid, and enter the number on the Bidding Schedule. The sum of these numbers is the A+B amount, and will be used for comparison of bids in determining the lowest responsible bidder.

SECTION 103 - AWARD AND EXECUTION OF CONTRACT:

103.01 Consideration of Proposals: the first paragraph of the Standard Specifications is revised to read:

After the proposals are opened and read aloud, they will be compared on the basis of the summation of the products of the quantities shown in the bidding schedule by the unit bid prices shown combined with the product of the contractor-specified completion time and the daily value. The results of such comparisons will be available to the public.

SECTION 103 - AWARD AND EXECUTION OF CONTRACT:

103.02 Interpretation of Proposals: of the Standard Specifications is modified to add:

- (D) For A+B projects, in the event of a discrepancy between the contractor-specified completion time and the extension for the contractor's "B" amount, the contractor-specified completion time will govern. The "B" amount will be re-calculated, and a new A+B amount will be computed accordingly.

SECTION 103 - AWARD AND EXECUTION OF CONTRACT:

103.04 Award of the Contract: the second paragraph of the Standard Specifications is revised to read:

The award of an A+B contract, if awarded, will be made by the Transportation Board to the responsible bidder with the lowest amount for the sum of the total construction cost and the product of the contractor-specified completion time and daily value, as specified in Subsection 102.08, and whose proposal complies with all the requirements prescribed. The A+B amount will not be used to determine payments to the contractor; all payments shall be in accordance with Section 109. If there are two or more low responsive bids that are identical in A+B amount, award will be made by drawing lots. The successful bidder will be notified by certified letter mailed to the address shown in the bidder's proposal that its bid has been accepted and that it has been awarded the contract.

(Contact the District and use either the following requirement for a critical path schematic diagram (CPM) in 108.03, or insert Stored Specification 108CPM.)

SECTION 108 - PROSECUTION AND PROGRESS:

108.03 Preconstruction Conference: of the Standard Specifications is modified to add:

The contractor shall be responsible for planning, scheduling and reporting the progress of the work to ensure completion of the contract on or before the contractor-specified completion time.

The contractor shall submit a schedule, based upon the sequence of construction shown in the project plans or in these special provisions, in accordance with the following:

- (A) The schedule shall be submitted at the Preconstruction Conference for the Engineer's acceptance. It shall be a schematic (arrow) diagram or precedence diagram, showing the work stages and operations for all activities required by the contract. The diagram shall be in sufficient detail to allow day-to-day monitoring of the contractor's operations. Along with the schedule, the contractor shall show work days, calendar days and dates. The diagram shall include milestone events as identified by the contractor and accepted by the Engineer.

(B) The schedule shall include the following features:

- (1) It shall be time-scaled in calendar days. All major activities shall be shown with their starting and finishing dates. The schedule shall have a size and scale acceptable to the Engineer.
- (2) It shall show the order and interdependence of activities and the sequence of work as reflected in the Schedule Report specified in (B)(6) below.
- (3) It shall include, in addition to all construction activities, such tasks as mobilization, demobilization, submittal and approval of samples of materials and shop drawings, procurement of significant materials and equipment, and fabrication of special items, installation and testing.
- (4) The activities shall be sufficiently detailed so that a reviewer can follow the sequence. For example, the activities shall show forming, reinforcing, and placement of concrete on the calendar days they are scheduled to be performed.
- (5) The activities shall be organized and described so as to conform to the contract bid items. Activity descriptions shall be unique and specific with respect to the type of work and location.
- (6) The diagram shall be accompanied by a Schedule Report with a tabulation of the following data for each activity:
 - (a) Activity description
 - (b) Activity duration
 - (c) Start date
 - (d) Finish date
 - (e) Responsibility for activity - e.g., contractor, subcontractor, supplier, etc.
 - (f) Resource loading for each activity listing personnel, equipment and anticipated revenue.

The contractor shall participate in a review and evaluation of the schedule by the Engineer. Any revisions necessary as a result of their review shall be submitted for acceptance to the Engineer. The accepted schedule shall then be used by the contractor for planning, organizing, executing, and directing the work and for reporting progress of work accomplished.

The contractor shall provide seven copies of the schedule and report to the Engineer. If during construction, the Engineer determines that the schedule requires revision, either wholly or in part, he will so direct the contractor. The contractor shall submit seven copies of the revised schedule within five calendar days.

No measurement or direct payment will be made for contractor costs relating to preparation and submission of schedules and reports and revisions thereto, the cost being considered as included in the prices paid for contract items.

Acceptance of the contractor's schedules by the Engineer is not to be construed as relieving the contractor of his obligation to complete the work within the contract time; or as granting, rejecting, or in any other way acting on the contractor's requests for adjustments to the date for completing contract work, or claims for additional compensation. Such requests shall be processed in strict compliance with other relevant provisions of the contract.

SECTION 108 - PROSECUTION AND PROGRESS:

108.04 Prosecution and Progress: the second paragraph of the Standard Specifications is revised to read:

Unless suspended, the work shall be diligently and continuously carried on to completion and the contractor agrees to provide at all times an adequate force of labor and sufficient materials and equipment to insure the completion of the contract within the contractor-specified completion time. The progress of the work shall be at a rate sufficient to complete the contract in an acceptable manner within the contractor-specified completion time.

SECTION 108 - PROSECUTION AND PROGRESS:

108.08 Determination and Extension of Contract Time: of the Standard Specifications are revised to read:

**** INSERT NUMBER OF CALENDAR DAYS ****

The Department-determined completion time allowed for the work included in the contract will be **XXXX** calendar days. However, the Contract Time shall be the contractor-specified completion time as shown on the bidding schedule.

FOR A+B PROJECTS, THE CONTRACT TIME SHALL BE ON A CALENDAR DAY BASIS, AND SHALL CONSIST OF THE NUMBER OF CALENDAR DAYS SPECIFIED BY THE CONTRACTOR FOR COMPLETION OF THE PROJECT, AS SHOWN ON THE BIDDING SCHEDULE, COUNTING FROM THE STARTING DATE AND INCLUDING ALL SUNDAYS, HOLIDAYS AND NON-WORK DAYS.

All calendar days elapsing between the effective dates of any orders of the Engineer to suspend work and to resume work for suspensions not the fault of the contractor will be excluded.

Contract time is based on the amount of work included in the original contract. If satisfactory fulfillment of the contract involves alterations to the contract that affect the contractor's completion time, the contractor may request a supplemental agreement which extends the contract time. Such request will be made in accordance with Subsection 104.03, shall be in the form of a Request for

Extension of Contract Time, and shall include the contractor's revised schedule and all other pertinent data.

The request shall show why an increase of contract time is warranted. An extension of contract time will not be considered unless the work affected is a controlling item on the contractor's schedule at the time of the alteration or becomes a controlling item as a result of the alteration.

If a nationwide shortage exists in basic materials or standard items which are necessary in the fabrication or manufacture of equipment, parts or articles to meet the specific requirements of the project, a serious widespread shortage of such equipment, parts or articles may be considered as a valid reason for the extension of contract time. Delivery delays or shortages caused by ordinary supply fluctuations are not nationwide shortages and therefore are not valid reasons for extension of time.

The contractor's plea that the Department-determined completion time or the contractor-specified completion time is insufficient will not be a valid reason for extension of time.

If the contractor requests additional time and if the Engineer finds that the work activities controlling overall job progress and the projected completion date were delayed because of conditions beyond the control and without the fault of the contractor, and could not have been anticipated by the contractor, the Engineer may extend the time for completion in such amount as the conditions justify. The extended time for completion shall then be in full force and effect the same as though it were the original time for completion.

When substantial completion has been duly determined by the Engineer in accordance with the requirements of Subsection 105.19, the daily time charge will cease.

SECTION 108 - PROSECUTION AND PROGRESS:

108.09 Failure to Complete the Work on Time: the first and second paragraphs of the Standard Specifications are revised to read:

For each whole or partial calendar day that the contractor shall fail to achieve substantial completion after the contractor-specified completion time, the sum equal to the daily value, as shown in the special provisions, will be deducted from any monies due the contractor. The daily value sum will continue to be assessed beyond the Department-determined completion time, as necessary, until substantial completion is achieved.

For each whole or partial calendar day that the contractor shall fail to achieve substantial completion after the Department-determined completion time, the sum shown in the schedule of liquidated damages specified below will also be deducted from any monies due the contractor. Such sum, when applied, will be in addition to the daily value charge specified herein, and will continue until substantial completion is achieved.

The monies will be deducted, not as penalties, but as liquidated damages; provided however, that due account will be taken of any adjustment of the contract time for the completion of the work allowed under the provisions of Subsection 108.08.

Permitting the contractor to continue and finish the work or any part of it after the contractor-specified completion time or after the date to which the contractor-specified completion time may have been extended will in no way operate as a waiver on the part of the Department of any of its rights under the contract.

APPENDIX B

A+B PROJECTS; DETAILS & RESULTS

PROJECT NO	DESCRIPTION	DAILY VALUE (RUC)	STATE ESTIMATE				BID AMOUNT				DAYS EARLY	INCENTIVE EARNED	MAXIMUM POSSIBLE INCENTIVE
			"a"	days	"b"	"a+b"	"a"	days	"b"	"a+b"			
H304601C	Holbrook TI	\$1,300	\$4,994,000	385	\$500,500	\$5,494,500	\$5,272,000	385	\$500,500	\$5,772,500	77	\$100,100	\$100,100
H391201C	Hohokam	\$2,700	\$2,005,002	120	\$324,000	\$2,329,002	\$3,031,785	120	\$324,000	\$3,355,785	0	\$0*	N/A*
H461801C	Bethany TI	\$20,000	\$11,061,300	300	\$6,000,000	\$17,061,300	\$11,465,728	225	\$4,500,000	\$15,965,728	35	\$600,000	\$600,000
H447801C	I-17 Design Build.	\$16,000	\$64,749,450	910	\$14,560,000	\$79,309,450	\$79,729,000	609	\$9,744,000	\$89,473,000	7	\$0*	N/A*
H441301C	I-8B, Ave 3E to 7E	\$3,000	\$1,350,000	100	\$300,000	\$1,650,000	\$1,447,079	60	\$180,000	\$1,627,079	-23	-\$69,000	\$36,000
H274101C	Cottonwood	\$4,800	\$4,417,910	210	\$1,008,000	\$5,425,910	\$4,494,190	200	\$960,000	\$5,454,190	42	\$192,000	\$192,000
H492101C	Red Mtn.; Country Club to Gilbert	\$10,000	\$66,667,000	600	\$6,000,000	\$72,667,000	\$53,744,831	525	\$5,250,000	\$58,994,831		NOT COMPLETE	\$1,050,000
H554301C	Pima; Scottsdale and Princess	\$10,000	\$6,838,360	270	\$2,700,000	\$9,538,360	\$6,258,909	255	\$2,550,000	\$8,808,909		NOT COMPLETE	\$510,000
H537001C	US 60 Design Build.	\$50,000	\$239,285,800	1,100	\$55,000,000	\$294,285,800	\$184,292,800	737	\$36,850,000	\$221,142,800		NOT COMPLETE	N/A*
H323002C	Pima; Scottsdale to Princess	\$14,400	\$23,450,000	450	\$6,480,000	\$29,930,000	\$24,537,697	230	\$3,312,000	\$27,849,697		NOT COMPLETE	\$662,400
H529901C	Red Mtn; Gilbert to Higley	\$20,000	\$50,900,000	600	\$12,000,000	\$62,900,000	\$46,835,303	353	\$7,060,000	\$53,895,303		NOT COMPLETE	N/A*
H508701C	Pecos Rd. Connection	\$3,000	\$22,856,668	450	\$1,350,000	\$24,206,668	\$22,184,805	380	\$1,140,000	\$23,324,805		NOT COMPLETE	\$228,000
* Incentive not specified in the contract													

APPENDIX C

COMPUTATION OF DAILY VALUE

PROJECT DATA	CONDITION 1	CONDITION 2	CONDITION 3	CONDITION 4	CONDITION 5	CONDITION 6
STATE ESTIMATED DURATION=						
STATE \$ ESTIMATE=						
ADT=						
% TRUCKS=						
AVG USER WAGE=						
# OF LANES OPEN (CONSTR)=						
DURATION OF T.C. CONDITION=						
SPEED LIMIT (CONSTR)=						
LENGTH (CONSTR)=						
# OF LANES OPEN (NEW)=						
SPEED LIMIT (NEW)=						
LENGTH (NEW)=						
CONSIDER OTHER IMPACTS(YES/NO)=						
ONE DIRECTIONAL TRAFFIC (YES/NO)=						
MAXIMUM DAILY VALUE=						
ADD. TIME TO TRAVEL THRU (HRS)=						
DAILY VALUE=						
SUM=						
TOTAL DAILY VALUE ALLOWED=						

Spread Sheet Instructions

Project data for the various phases of work and traffic control conditions are entered in the columns.

Condition 1, Condition 2, ...: Replace with the location of the condition that impedes traffic. The spread sheet allows for 6 conditions.

State Estimated Duration: Enter the state estimated duration in calendar days.

State \$ Estimate: Enter state estimated construction cost. (This is required as the maximum Daily Value allowed is based on this.)

ADT: Enter the Average Daily Traffic. This can be obtained off of Traffic Studies Group web page.

% Trucks: Enter the percent of commercial vehicle traffic. This can also be obtained off of Traffic Studies Group web page.

Avg. User Wage: This will be calculated and shown here.

Of Lanes Open (Constr.): Enter the number of lanes that are open to traffic (both directions, including center turn lanes) under the particular traffic control condition. This information should be in the traffic control plans.

Duration of T.C. Condition: Enter the number of calendar days this particular traffic control condition will be in place. This information will need to be provided by the designer.

Speed Limit (Constr.): Enter the speed limit that the traffic control plans note that will be posted during this particular condition.

Length (Constr.): Enter the length (miles) of the traffic control condition as shown in the traffic control plans.

Of Lanes Open (New): Enter the number of lanes that are open to traffic (both directions, including center turn lanes) in this location when the project is completed. This information should be in the signing and striping plans.

Speed Limit (New): Enter the speed limit that the signing and striping plans note will be posted in this location, when the project is completed.

Length (New): Enter the length (miles) of this particular segment when the project is completed as shown in plans.

Consider Other Impacts (Yes/No): By entering “yes” a factor of 1.2 is applied. This will account for any one of the Road User Impact Factors (High concentration of businesses, high accident areas, heavy pedestrian usage or school zone). This factor may be adjusted if more than one impact exists. Otherwise enter “no”.

One Directional Traffic (Yes/No): A “yes” is only entered when the traffic control condition allows for only one direction of traffic at a time (i.e. pilot car operations). A factor of 2 is applied as it now takes the road user approximately twice as long to travel through the work zone than that previously determined.

Maximum Daily Value: The Maximum Daily Value allowed is calculated and shown. This value is the lesser of the Daily Value or 20 % of state \$ estimate / state estimated time. (20% is based on the assumption that should a contractor accelerate his schedule the majority of the additional cost is in overtime labor. For each additional hour working it will cost him an additional half hour (assuming overtime at time and a half). Assuming labor comprises of 40% of the total contract cost; $0.5\text{hrs} \times 0.40 = 0.2$ or 20%.)

Add. Time to Travel Thru (Hrs.): The additional time (hours) for one vehicle to travel this particular segment, as compared to when the project is finished is calculated and shown.

Daily Value: The Daily Value for each condition are computed and shown

Sum: The sum of each Daily Value for all conditions is calculated and shown.

Total Daily Value Allowed: This is the lesser of line Maximum Daily Value and Sum. This value is the Daily Value entered in the contract.

APPENDIX D

Calculations

Use formula: $t = l/s$, where:

t = time (hours); l = distance traveled (miles); s = posted speed limit (miles/hour)

Calculating Δt when the ADT/lane is less than or equal to 5,000

$$\Delta t = t_c - t_f$$

$$t_c = l_c/s_c$$

$$t_f = l_f/s_f$$

$$\Delta t = (l_c/s_c) - (l_f/s_f)$$

t_c = time to travel from point a to b during construction.

l_c = distance from point a to b during construction (this may be the length of a detour route).

s_c = average posted speed between point a and b during construction.

t_f = time to travel from point a to b when the project is finished.

l_f = distance from point a to b after the project is finished

s_f = average posted speed between point a and b when the project is finished.

Calculating Δt when ADT/lane > 5,000

$$t_c = l_c/s_c(1 + (A_c - 5000)/10,000)$$

$$t_f = l_f/s_f(1 + (A_f - 5000)/10,000)$$

A_c = Avg. Daily Traffic per lane under construction = ADT/b_c

b_c = # of lanes open under construction

A_f = Avg. Daily Traffic per lane when completed = ADT/b_f

b_f = # of lanes open when finished

One Directional Travel

In the calculations above it was assumed that there was two way traffic. However in some cases (pilot car operation) one direction of travel may only move through the work area at a time. The spread sheet allows you to compute this scenario; it now assumes it will take the average vehicle twice as long to travel through the project ($2 \times \Delta t$).